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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 10/727,289 | 12/03/2003 | Armin R. Volkel | D/A3237 XERZ 2 00607 | 6700 |

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| EXAMINER | |
|---|---|
| FICK, ANTHONY D | |
| **ART UNIT** | **PAPER NUMBER** |
| 1753 | |

DATE MAILED: 10/31/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/727,289 | VOLKEL ET AL. | |
| | Examiner | Art Unit | |
| | Anthony Fick | 1753 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *03 December 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-19* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-19* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *03 December 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *12/3/03 6/10/04*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

## DETAILED ACTION

### *Claim Rejections - 35 USC § 102*

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 1, 2, and 5 through 7 are rejected under 35 U.S.C. 102(e) as being anticipated by Wang et al. (U.S. 6,596,143).

Wang teaches an apparatus for manipulating particles and a method to use such an apparatus. The apparatus comprises electrically independent branches. A first branch is a traveling wave grid with a plurality of electrodes (column 2, paragraph 3). A second branch of the apparatus is also a traveling wave grid with a plurality of electrodes (column 2, paragraph 3). Also shown in figures 3A, 3B, and 4, the branches each contain a plurality of buses providing electrical communication with the plurality of electrodes. The sets of electrodes are preferably disposed on separate substrates (column 3, last paragraph), thus the grids are the first and second traveling wave grids of claim 1. Wang also teaches separation can be done on particles suspended in a fluid (column 8, last paragraph) and teaches the separation can be accomplished in continuous or a batch mode where the suspension fluid is in contact with both sets of

electrodes (column 24, paragraph 2). Wang further teaches a controller sends multi phase voltages to the electrodes through the plurality of buses (column 3, first paragraph). Figures 14A, 14B, 15A, 15B, 15C and 17B all show the agent migrating through the fluid medium partially across the first traveling wave grid in a direction perpendicular to the electrodes and then further migrating partially across the second traveling wave grid in a perpendicular direction to the electrodes. Thus all the requirements of claim 1 are met. Figure 1B shows the first and second traveling wave grids oriented at ninety-degree angles from each other, thus meeting claim 2.

As described above, the device of Wang contains a first and second traveling wave grid meeting the requirements of claim 5, a voltage controller and provides a fluid medium in proximity to the two traveling wave grids. Wang further teaches several different methods of separation of particles seen in figures 14A, 14B, 15A, 15B, 15C, and 16B through D. One such method concentrates the particles on one part of the grid, and then selectively moves the agent through the branches to separate and concentrate the particles further (column 26, paragraph 1). Thus the teaching of Wang meets claim 5. As seen in figures 16B, 16C, and 16D, the agent in the second region (shown in 16D) has a higher concentration than the first region (shown in 16C) and both are higher than the initial seen in 16B. Thus claims 6 and 7 are also met.

3. Claims 8 through 14 are rejected under 35 U.S.C. 102(b) as being anticipated by McBride et al. (U.S. 6,296,752).

McBride teaches an apparatus for separating molecules. The apparatus has electrodes for a traveling wave protocol (column 5, paragraph 4) on a substrate

containing a two-dimensional array of electrodes (column 5, paragraph 2), the electrodes can be individually controlled by an electronic switching device (column 5, paragraph 3), and the traveling wave protocol can be produced by a multiphase signal as shown in figure 10. Each electrode can be individually controlled thus a plurality of electrical contacts between the electrodes and the voltage controller must be present in the device of McBride. Thus, McBride meets all the requirements of claim 8. As figure 6A shows, the electrodes are disposed in linear rows and columns extending at right angles with respect to each other and since each electrode can be individually controlled, a row may concurrently receive a signal and a column may concurrently receive a signal, thus meeting claim 9. McBride also teaches in figure 9 a planar conductor providing a voltage potential with respect to the grid that provides a bias field, thus meeting claim 10.

The device of McBride is described above and meets the requirements of a selectively addressable traveling wave grid system in claim 11. McBride further teaches separation of particles in the system by providing a fluid medium on top of the grid, then applying a control signal to the electrodes to separate the particles as shown in figure 7. McBride also teaches the separations can be carried out using distinct protocols in each separate direction (column 5, paragraph 2). Figure 7 shows the traveling waves pushing the molecule in the rows and the columns at the same time, however to carry out the separation in each direction as McBride teaches (column 5, paragraph 2) the grid would behave more like the electrode setup of figure 5. In this setup, the traveling waves would be sent through each row to collect the agent on the one side of the grid

before the signal would be sent through the columns to further concentrate the sample. Thus the method of McBride meets claims 11 and 12. McBride teaches this method promotes separation and operates similar to traditional two-dimensional electrophoresis devices (column 4, last paragraph). The separation is enhanced utilizing the two dimensions similar to the enhancement seen in 2D gel electrophoresis, thus the concentration of the agent after the second dimension separation occurs is greater than the concentration of the agent after the first dimension separation. The first dimension separation still produces a higher concentration than the original as the movement in the first direction enhances the separation of the agent. Thus claims 13 and 14 are also met.

***Claim Rejections - 35 USC § 103***

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wang as applied to claims 1, 2, and 5 through 7 above, and further in view of Koening (EP 0 558 233 A1).

The teachings of Wang are as stated above for claims 1, 2, and 5 through 7.

The difference between Wang and claim 3 is the requirement the second traveling wave grid be oriented substantially parallel to the first grid.

Koening teaches a device to separate particles using a traveling wave (abstract). This device contains two grids of electrodes oriented parallel to each other as shown in figure 2. Figure 7 shows the electrodes are connected to separate busses to create the traveling wave effect.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to configure the traveling wave grids of Wang in the parallel configuration of Koening because the parallel configuration creates a smaller trench and a relatively small sample of liquid or electrolyte is needed for analysis purposes (Koening page 4, paragraph 5). Because both Wang and Koening were concerned with separation of particles using traveling waves, one would have a reasonable expectation of success from the combination. Thus the combination meets claim 3.

6. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wang as applied to claims 1, 2, and 5 through 7 above, and further in view of McBride et al. (U.S. 6,296,752).

The teachings of Wang are as stated above for claims 1, 2, and 5 through 7.

The difference between Wang and claim 4 is the requirement of a planar conductor providing a voltage potential with respect to at least one of the traveling wave grids to provide a bias field.

McBride teaches an apparatus for separating molecules. The apparatus has electrodes for producing a traveling wave protocol (column 5, paragraph 4) on a substrate. McBride also teaches in figure 9 a planar conductor providing a voltage potential with respect to the grid that provides a bias field.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to utilize the planar conductor of McBride to provide a bias field with respect to the traveling wave grid of Wang because the conductor of McBride allows the generation of a pH traveling wave along with the dielectrophoretic traveling wave which enhances separation and adds programmability (McBride column 6, paragraph 9). Because both Wang and McBride were concerned with separations utilizing traveling waves, one would have a reasonable expectation of success from the combination. Thus the combination meets claim 4.

7. Claims 15, 18 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yamanishi et al. (U.S. 6,949,355) in view of Betts et al. (U.S. 5,569,367).

Yamanishi teaches a method for separating cells from fluid samples. Within this method, a filtration chamber is utilized to precisely separate particles based on their sizes (column 20, paragraph 3). This filter element collects agents dispersed in a fluid medium having a size greater than the pass-through size limit of the filter element. Yamanishi also teaches attaching a microelectrode grid onto the filter, arranged in such a way so that traveling wave dielectrophoresis can cause the sample components to move on the filter surface (column 20, paragraph 5). The voltage controller for these electrodes provides a multi-phase signal to the electrodes to produce the traveling wave (column 23, paragraph 5).

The difference between Yamanishi and claim 15 is the requirement of a detector adapted to detect agents in the fluid medium, the detector disposed in proximity to a

region of the traveling wave grid. Yamanishi only teaches a detector for determining the volume of fluid in the sample.

Betts teaches an apparatus for separating a mixture. The apparatus as shown in figure 1, utilizes a grid of electrodes to create dielectrophoretic forces and separate out particles from a mixture and has a detector set up at the exit of the grid of electrodes to measure the type and quantity of particles separated.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to include the detector of Betts in the filter system of Yamanishi because the detector allows indication of the presence of particles as they pass (Betts column 5, paragraph 2). Because both Betts and Yamanishi are concerned with separating particles out of a mixture, one would have a reasonable expectation of success from the combination. Thus the combination meets claim 15. The device of Yamanishi in view of Betts also meets the requirements of claim 18. Yamanishi teaches the traveling wave grid is upstream of the filter element, the filter collects agents with a greater size, and the traveling wave grid is activated to move particles along the filter element (column 20, last two paragraphs). In view of Betts, the particles leaving the electrode grid are moved to a detector that detects the agents. Thus Yamanishi in view of Betts meets all the requirements of claim 18. The fluid medium Yamanishi teaches is any fluid from which components are to be separated or analyzed (column 8, last paragraph). Thus the choice of a fluid medium depends on the type of separation attempted. It would be obvious to choose water, as there are a large variety of substances that can be dissolved within it. Thus claim 19 is also met.

8. Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yamanishi in view of Betts as applied to claims 15, 18 and 19 above, and further in view of Docoslis et al. (U.S. 5,626,734).

The teachings of Yamanishi in view of Betts are as stated above for claims 15, 18 and 19.

The difference between Yamanishi in view of Betts and claim 16 is the requirement of a second traveling wave grid positioned proximate to the traveling wave grid disposed on the filter element.

Docoslis teaches a filter method using dielectrophoretic forces to filter viable cells (abstract). Figure 5 shows a plurality of electrode grids set up within the flow field to accomplish the filtering function.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to utilize the multiple electrode grids Docoslis teaches within the filter system of Yamanishi in view of Betts because the multiple grids allow for larger surface areas, and increase the scale up potential of the device. The larger surface areas produce a higher throughput of the filter device. Because both Docoslis and Yamanishi in view of Betts are concerned with filtering cells utilizing dielectrophoretic effects, one would have a reasonable expectation of success from the combination. Thus the combination meets claim 16.

9. Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yamanishi in view of Betts as applied to claims 15, 18 and 19 above, and further in view of McBride et al. (U.S. 6,296,752).

The teachings of Yamanishi in view of Betts are as stated above for claims 15, 18 and 19.

The difference between Yamanishi in view of Betts and claim 17 is the requirement of a planar conductor providing a voltage potential with respect to the traveling wave grid to provide a bias field.

McBride teaches an apparatus for separating molecules. The apparatus has electrodes for producing a traveling wave protocol (column 5, paragraph 4) on a substrate. McBride also teaches in figure 9 a planar conductor providing a voltage potential with respect to the grid that provides a bias field.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to utilize the planar conductor of McBride to provide a bias field with respect to the traveling wave grid of Yamanishi in view of Betts because the conductor of McBride allows the generation of a pH traveling wave along with the dielectrophoretic traveling wave which enhances separation and adds programmability (McBride column 6, paragraph 9). Because both Yamanishi in view of Betts and McBride were concerned with separations utilizing traveling waves, one would have a reasonable expectation of success from the combination. Thus the combination meets claim 17.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Anthony Fick whose telephone number is (571) 272-6393. The examiner can normally be reached on Monday thru Friday 8 AM to 5 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen can be reached on (571) 272-1342. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Anthony Fick ADF
AU 1753
October 26, 2005

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